

Kenneth T. Bogen, DrPH, DABT
Managing Scientist**Professional Profile**

Dr. Kenneth T. Bogen, a Managing Scientist in Exponent's Health Sciences Center for Exposure Assessment and Dose Reconstruction, has nationally recognized expertise in risk assessment for environmental carcinogens and in related exposure, pharmacokinetic, dose-response and uncertainty analysis. Before joining Exponent in 2007, he led experimental, epidemiological and mathematical-modeling research on health risks posed by environmental exposures to chemicals and ionizing radiation, as a University of California environmental scientist for 20 years at Lawrence Livermore National Laboratory.

Dr. Bogen consults as an expert on chemical-risk and statistical aspects of litigation involving environmental, occupational, dietary and consumer-product exposures, as well as groundwater contaminants. He helped develop methods now widely used to quantitatively characterize uncertainty and variability in environmental exposure and risk, and to develop and apply physiologically based pharmacokinetic (PBPK) models, and biologically based, mechanistic dose-response models to assess risks posed by exposures to volatile solvents, carcinogens and cytotoxic chemicals.

Dr. Bogen served as a Member of the National Academy of Sciences/National Research Council (NRC) committees that issued *Science and Judgment in Risk Assessment* (1994) and *Review of the Army's Technical Guides on Assessing and Managing Chemical Hazards to Deployed Personnel* (2004); served as expert panelist at the NRC Standing Committee on Risk Analysis Issues and Reviews, Workshop on Uncertainty in Cancer Risk Based on Bioassay Data (2007); chaired the Metabolism and Mode of Action Panel, *Naphthalene State of the Science Symposium* (NS³), Monterey, CA (2006); and chaired the U.S. Consumer Product Safety Commission's Chronic Hazards Advisory Panel on Diisononyl Phthalate (DINP) (2000–2001). Dr. Bogen also authored and continues to develop *RiskQ* computer software (a University of California-licensed *Mathematica*® package) for biostatistics, stochastic modeling, and uncertainty analysis, authored *Uncertainty in Environmental Health Risk Assessment* (Garland, New York, 1990), and has authored or coauthored more than 100 reports and publications in peer-reviewed scientific journals. Dr. Bogen served as President (1995) and Councilor (2004–2006) of the Northern California Chapter of the Society for Risk Analysis.

Academic Credentials and Professional Honors

Dr.P.H., Environmental Health Science, University of California, Berkeley, 1986
M.P.H., Environmental Health Science, University of California, Berkeley, 1982
M.A., Science, Technology, and Public Policy, George Washington University, 1979
A.B., Biology, Princeton University, 1978

Patents

Patent 6,270,972: Kit for detecting nucleic acid sequences using competitive hybridization probes, August 7, 2001 (with J.N. Lucas and T. Straume).

Patent 6,027,879: Detection and isolation of nucleic acid sequences using a bifunctional hybridization probe, February 22, 2000 (with J.N. Lucas and T. Straume).

Patent 5,783,387: Method for identifying and quantifying nucleic acid sequence aberrations, July 21, 1998 (with J.N. Lucas and T. Straume).

Patent 5,731,153: Identification of random nucleic acid sequence aberrations using dual capture probes which hybridize to different chromosome regions, March 24, 1998 (with J.N. Lucas and T. Straume).

Patent 5,616,465: Detection and isolation of nucleic acid sequences using competitive hybridization probes, April 1, 1997 (with J.N. Lucas and T. Straume).

Publications

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Louis ED, Keating GA, Bogen KT, Rios E, Pellegrino KM, Factor-Litvak P. Dietary epidemiology of essential tremor: Meat consumption and meat cooking practices. *Neuroepidemiol* 2008; 30:161–166.

Bogen KT, Benson JM, Yost GS, Morris JB, Dahl AR, Clewell HJ, Krishnan K, Omiecinski CJ. Naphthalene metabolism in relation to target tissue anatomy, physiology, cytotoxicity and tumorigenic mechanism of action. *Regul Toxicol Pharmacol* 2008; 51(2 Suppl 1):S27–S36.

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Technical Reports

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Sheehan P, Brorby G, Bogen K, Berman, W, Holm S. New basis for interpreting historical exposures to dust from chrysotile-containing joint compound. Presented at the 2011 Annual Meeting of the American Industrial Hygiene Association, AIHce2011, Portland, OR, May 14–19, 2011.

Tsuji J, Bogen KT. Human biokinetic model of nickel release from medical devices. Presented at the 50th Annual Meeting of the Society of Toxicology, Washington, DC, March 6–10, 2011.

Bogen KT. *In vivo* dermal uptake pattern for 20 dilute aqueous organic chemicals is poorly predicted by models based on *in vitro* data. Presented at the 50th Annual Meeting of the Society of Toxicology, Washington, DC, March 6–10, 2011.

Bogen KT. Generic Hockey-Stick model performs as well or better than USEPA Benchmark Dose methodology. Presented at the 2010 Annual Meeting of the Society for Risk Analysis, Salt Lake City, UT, December 5–8, 2010.

Bogen KT. Generic Hockey-Stick model outperforms USEPA Benchmark Dose method to characterize dose-response. Presented at the NorCal Society of Toxicology Fall Symposium, Northern California Chapter of the Society of Toxicology, Genentech Campus, South San Francisco, CA, November 4, 2010.

Bogen KT. Generic Hockey-Stick model for estimating benchmark-dose and potency estimation. Presented at the 9th Annual Meeting of the International Dose-Response Society (Dose-Response 2010: Implications for Toxicology, Medicine and Risk Assessment), University of Massachusetts at Amherst, Amherst, MA, April 27-28, 2010.

Tsuji J, Hentz K, Rosenbloom S, Bogen K, Yost L. Health risk of internal nickel exposure from medical devices. Presented at the 49th Annual Meeting of the Society of Toxicology, , Salt Lake City, UT, March 7–11, 2010.

Sheehan P, Bogen KT, Brorby G, Goswami E. Improved estimates of worker exposure to benzene during parts washing based on a new approach analyzing solvent and air data for other aromatic constituents. Presented at the 2009 American Industrial Hygiene Conference and Expo, Denver, CO, May 22–27, 2010.

Bogen KT. A Screening assessment of potential hazard posed by six phthalates in children's consumer products in California. Presented at The Toxicology Forum, 35th Annual Winter Meeting, 2–4 February 2010, Washington DC, 2010.

Sheehan P, Bogen KT, Brorby G, Goswami E. Worker inhalation exposure to benzene from solvents during parts washing. Presented at the 2009 Annual Meeting of the Society for Risk Analysis, Baltimore, MD, December 6–19, 2009.

Bogen KT. Human cancer risk of soluble cobalt: Biokinetic extrapolation from rodent bioassay data. Presented at the 48th Annual Meeting of the Society of Toxicology, Baltimore, MD, March 15–19, 2009.

Bogen KT. Mode of action (MOA) uncertainty for “dual mode” carcinogens: Impact on risk estimated from naphthalene-induced nasal tumors in rats. Abstract of presentation made at the 47th Annual Meeting of the Society of Toxicology, Seattle, WA, March 16–20, 2008.

Bogen KT. An adjustment factor to address mode of action (MOA) uncertainty for dual-mode carcinogens: The case of naphthalene-induced nasal tumors in rats. Abstract of presentation to be made at the Society for Risk Analysis 2007 Annual Meeting, San Antonio, TX, December 9–12, 2007.

Keating GA, Bogen KT, Chan J, Keating GA, Paine LJ, Simms EL, Holly EA, Felton JS. Elevated prostate-specific antigen in African American men with high meat-carcinogen intake: A prospective clinic-based study. Abstract. 2007 U.S. DOD Prostate Cancer Research Program, Atlanta, GA, September 14–18, 2007.

Bogen KT, Chan J, Keating GA, Paine LJ, Simms EL, Holly EA, Felton JS. Prostate-specific antigen levels and dietary PhIP in African Americans: A prospective clinic-based study. Abstract. 2007 Annual Meeting of the American Association for Cancer Research, Los Angeles, CA, April 14–18, 2007.

Bogen K. An adjustment factor to address mode of action (MOA) uncertainty for dual-mode carcinogens: The case of naphthalene-induced nasal tumors in rats. Presentation given as expert panelist at the National Research Council Standing Committee on Risk Analysis Issues and Reviews, Workshop on Uncertainty in Cancer Risk Based on Bioassay Data, Washington, DC, June 5, 2007.

Bogen KT, Burton EA, Freidmann SJ, Gouveia F. Source terms for CO₂ risk modeling and GIS/simulation based tools for risk characterization. GHGT8: 8th International Conference on Greenhouse Gas Technologies, Trondjheim, Norway, June 19–22, 2006.

Bogen KT, Homann SG, Gouveia FJ, Neher LA. Prototype near-field/GIS model for sequestered-CO₂ risk characterization and management. In: Proc. International Symposium on Site Characterization for CO₂ Geological Storage (CO₂SC 2006), pp. 237–239, Lawrence Berkeley National Laboratory, Berkeley, CA, March 20–22, 2006.

Pickles WL, Gouveia F, Bogen K, Rau G, Burton E. Integrated monitoring and modeling of CO₂ leakage risk using remote sensing, ground-based monitoring, atmospheric models and risk-indexing tools. Abstract. Session H42. American Geophysical Union Meeting, Fall 2006.

Bogen KT. Cancer risk and hormesis: Plausibility and implications. 45th Annual Meeting of the Society of Toxicology, San Diego, CA, March 5–9, 2006.

Bogen KT, Keating GA, Holly EA, Chan J, Paine L, Simms EL, Nelson DO, Felton J. Prostate serum antigen levels and dietary heterocyclic amines in African Americans: A prospective clinic-based study. Abstract 2103. 97th Annual Meeting of the American Association for Cancer Research, Washington, DC, April 1–5, 2006.

Bogen KT, Hamilton TF, Brown TA, Marchetti AA, Martinelli RE, Kehl SR. Age-related trend in elevated plutonium-239 measured by AMS in urine samples collected in 1998–2003 from Enewetak residents and Rongelap resettlement workers. Presented at the 51st Annual Radiobioassay and Radiochemical Measurements Conference, Stateline, NV, October 24–28, 2005.

Bogen KT, Hickman DP, Hamilton TF, Brown TA, Cox CC, Marchetti AA, Martinelli RE. AMS analysis of ²³⁹Pu in archived occupational samples. Presented at the 51st Annual Radiobioassay and Radiochemical Measurements Conference, Stateline, NV, October 24–28, 2005.

Keating G, Bogen K, Holly E, Baker W, Paine L, Felton J. Prostate cancer screening and heterocyclic amine intake in African Americans. Presented at the 95th Annual Meeting of the American Association for Cancer Research, Anaheim, CA, April 16–20, 2005.

Bogen K, Baker W, Chan J, Nelson D, Holly E, Keating G, Paine L, Felton J. Prostate cancer screening and dietary HA exposure in African-Americans. Poster presented at the University of California Davis Health System Future Fair, Sacramento, CA, May 5, 2005.

Hamilton TF, Brown TA, Martinelli RE, Tumey SJ, Kehl SR, Bogen KT, Buchholz BA, Hickman DP, Wood-Zika AR, Langston RG. Urinary excretion of plutonium isotopes based on accelerator mass spectrometry: baseline measurements from the Marshall Islands. UCRL-ABS-234231. Abstract, Health Physics Society 41st Midyear Topical Meeting (Oakland, January 2008), Lawrence Livermore National Laboratory, Livermore, CA, 2007.
https://marshallislands.llnl.gov/pdf/Hamilton_UCRL-ABS-234231.pdf

Bogen KT. Chemical risk analysis for environmental health triage and consequence management. Abstract. Presented at 2004 Annual Meeting of the Society for Risk Analysis Palm Springs, CA, December 5–8, 2004.

Bogen KT, Holly EA, Baker W, Keating GA, Paine L. Cooked meat carcinogens and prostate cancer screening in African Americans. Abstract. Presented at 14th Annual Conference of the International Society of Exposure Analysis, Philadelphia, PA, October 17–21, 2004.

Bogen KT, Holly EA, Baker W, Keating GA, Paine L. Cooked meat carcinogens and prostate cancer screening in African Americans. Abstract of poster presented at the 10th Annual Cancer Research Symposium, University of California Davis Cancer Center, Sacramento, CA, October 20–21, 2004.

Bogen KT, Keating GA, Holly EA. Prostate cancer screening and heterocyclic amine intake in African Americans. Abstract #1101 of poster presented to the 2004 Annual Meeting of the American Association for Cancer Research, Orlando FL, March 27–31, 2004.

Bogen K. Hypersensitivity to gamma radiation: LLNL/CCI Collaborative Studies Sponsored by the USDOE Low Dose Research Program. UCRL-PRES-152527. Lawrence Livermore National Laboratory, Livermore, CA, 2003.

Bogen KT, Marchetti A, Brown TA. Use of a correlated compound-binomial model to assess absence of non-counting noise in Pu-isotope ratios measured by AMS at LLNL. Poster presented at the 9th International Conference on Accelerator Mass Spectrometry, Nagoya University, Chikusa, Nagoya, Japan, September 9–13, 2002.

Bogen KT, Cullen J. Residential radon and lung cancer mortality in U.S. women who predominantly never smoked. Abstract 26.08. p. 90. In: 12th Conference of the International Society of Exposure Analysis (ISEA) and 14th Conference of the International Society for Environmental Epidemiology (ISEE), Vancouver, BC, August 11–15, 2002.

Enns, L, Murtha A, Bogen K, Weinfeld M. Low-dose dose-response of proliferating human cells exposed to low dose rate γ -radiation. Abstract. U.S. Department of Energy Office of Biological and Environmental Research Low Dose Radiation Research Program Workshop III, March 25–27, 2002.

Enns L, Weinfeld M, Hall L, Keating G, Murphy G, Bogen K, Langlois R. Low dose rate gamma radiation increases cytotoxicity as revealed by gel-microdrop (GMD) flow cytometry. Abstract. Annual Meeting of the Society of Toxicology, San Francisco, CA, March 2001.

Enns L, Weinfeld M, Bogen K, Murtha A. Hypersensitive-nonlinear low-dose dose-response for arrested proliferation of human A549 cells exposed to low-dose gamma radiation, detected by gel-microdrop flow cytometry. Abstract. p. 247. In: DOE/NASA Radiation Investigators' Workshop. U.S. Department of Energy, Washington, DC, June 2001.

Bogen KT. A unified approach to characterizing risks involving an uncertain carcinogenic mechanism: Groundwater trichloroethylene at a USAF Base [Abstract]. *Toxicologist* 2000; 54(1):421.

Witschi HP, Bogen KT. Carcinogenic potency of environmental tobacco smoke (ETS) in strain A/J mice [Abstract]. *Toxicologist* 2000; 54(1):183–184.

Keating GA, DuTeaus SB, Bogen KT. The effect of surface contact on dermal absorption of pesticides from house dust. Abstract. Presented at the 10th Annual Conference of the International Society of Exposure Analysis, Pacific Grove, CA, October 24–27, 2000.

Keating GA, Bogen KT. Cooked-meat carcinogen exposure: New data and proposed study of possible effects on prostate cancer risk in African-Americans. Abstract. p. 1F-10o.

10th Annual Conference of the International Society of Exposure Analysis, Pacific Grove, CA, October 24–27, 2000.

Keating GA, Sinha R, Layton D, Salmon CP, Knize MG, Bogen KT, Lynch CF, Alavanja M. Comparison of heterocyclic amine levels in home-grilled meats with exposure indicators. Abstract. p. 1F-11p. 10th Annual Conference of the International Society of Exposure Analysis, Pacific Grove, CA, October 24–27, 2000.

Bogen KT, McKone TE. Prediction of risk from indoor exposure to tetrachloroethylene: Pharmacokinetic considerations under steady-state and dynamic exposure conditions. Proc. 80th Annual Meeting, Air Pollution Control Association, New York City, NY, June 21–26, 1987.

Prior Experience

Environmental Scientist, Energy and Environment Directorate L-396, University of California, Lawrence Livermore National Laboratory (1986–2007)
Program Analyst, U.S. Environmental Protection Agency Region 9, Office of Policy, Technical and Resource Management (1982)
Science Policy Analyst, U.S. Library of Congress, Congressional Research Service, Science Policy Research Division (1980–1981)

Academic Appointments

- Member, University of California Davis Cancer Center, 2002–2007

Research Experience

As a University of California environmental scientist at Lawrence Livermore National Laboratory (LLNL), Dr. Bogen most recently served as PI and/or project leader of the following studies pertaining to environmental carcinogen risk assessment:

- PI, “Mode-of-Action uncertainty for dual-mode carcinogens: Lower bounds for naphthalene-induced nasal tumors in rats implied by PBPK and 2-stage stochastic cancer risk models,” ORNL funded by USEPA ORD (2007). Project comprised drafting a white paper of USEPA regulatory interest addressing treatment of uncertainty in cancer risk estimated from animal bioassay data.
- PI, “PSA-Based Screening Outcome, Dietary Heterocyclic Amine Exposure, and Prostate Cancer Risk in African Americans,” DOD Prostate Cancer Res. Prog. competitive award W81XWH-05-1-0153 (2005-2007). A LLNL-led 3-year, partially overlapping supplement/extension of the 5-year clinic-based epidemiological study described just below, to expand the study to 700 men through 2007 and to add an additional (percent-free) PSA measure to the other prostate-cancer screening tests performed as described below. Collaborating investigators were based at Alta Bates Summit Hospital (Oakland, CA) and UC San Francisco Medical School.

- Project Leader, “Determining the Carcinogenic Significance of Heterocyclic Amines, Project 5: Prostate cancer screening and dietary HA exposure in African-Americans,” NIH/NCI P01 grant 2 NIH P01 CA55861-09A2 (2002-2006). A LLNL-led 5-year clinic-based epidemiological study of association between dietary exposure to cooked-meat (heterocyclic amine) mutagens (particularly, PhIP) and screening indicators of prostate cancer risk in 500 African-Americans. Collaborating investigators were based at Alta Bates Summit Hospital (Oakland, CA) and UC San Francisco Medical School.
- Co-investigator, “Environmental Epidemiology of Essential Tremor,” NIH/NINDS grant R01 NS03422 (2006-2010). This 5-year study of environmental and occupational risk factors for essential tremor, led by Dr. Elan Louis, M.D. of Columbia University Medical School, uses an LLNL-developed dietary meat-intake questionnaire and corresponding data analysis for 900 subjects planned over the period of study. In this work, a total of 1,235 meat questionnaires will be provided to Columbia University in annual lots, together with initial training on questionnaire interpretation and administration, and annual analysis of resulting data on estimated daily dietary intake of total heterocyclic amines (HAs), including the primary dietary HA (PhIP), for each participant completing a questionnaire.
- PI, “Retrospective Plutonium Biodosimetry by Modeling Urinary ^{239}Pu from Archived Occupational Samples,” 3-year LLNL competitively awarded RandD project 01-ERD-108 (2001-2003). This project successfully developed and demonstrated the application of accelerator mass spectrometry (AMS)--which is ~20- to 40-fold more sensitive than traditional alpha spectrometry methods for the purpose of Pu-exposure assessment--to analyze archived alpha-spectrometry urinalysis disks obtained from LLNL Pu workers in accordance with an approved LLNL IRB protocol. This study showed that AMS can be used to recover otherwise inaccessible information on urinary Pu excretion patterns over 10- to 20-year periods.
- PI, “DNA Damage vs. Cell Killing by Low-Dose-Rate Radiation: Ultrasensitive Measures, and Implications for Mechanistically Modeled Cancer Risk,” USDOE Low Dose Res. Prog. and Cross Cancer Institute, Alberta Cancer Board (2000-2002). This 3-year study developed and applied a gel-microdrop flow cytometry assay to assess low-dose dose-response of gamma-radiation-induced cell killing in human cells *in vitro*. This study showed that a previously well characterized “hyper-radiosensitivity” (HRS) low-dose dose-response phenomenon is induced very early after radiation exposure and that its underlying molecular mechanism involves dose-induced suppression of p53-triggered “apoptosis” or programmed cell death.

Research Awards

Society of Toxicology, Risk Assessment Specialty Section, Top 10 Publications in 2008
Demonstrating an Application of Risk Assessment (2008), for: Bogen (2008), *supra*.

Society for Risk Analysis Best Paper Award, Decision Science (2006), for: Bogen and Jones
(2006), *supra*.

Science Advisory Boards/Panels

ILSI, International Life Sciences Inst., Dose-Response Working Group (1991–1992)

NRC, National Academy of Sciences, National Research Council, Committee on Risk
Assessment of Hazardous Air Pollutants (1991–1994). *Science and Judgment in Risk
Assessment*, 1994 [student ed., Taylor and Francis, Washington DC, 1996]

U.S. EPA, Carcinogenicity, Reproductive/Developmental Toxicity and Systemic Toxicity of
Drinking Water Disinfectant By-Products (1998)

U.S. EPA, Ambient Water Quality Criteria Methodology: Human Health (1999)

U.S. CPSC, Chairman, U.S. Consumer Product Safety Commission. Chronic Hazard Advisory
Panel (CHAP) on Diisononyl Phthalate (DINP) (nominated by President of National
Academy of Sciences; 2000–2001; CHAP report to USCPSC issued in June 2001,
<http://www.cpsc.gov/LIBRARY/FOIA/Foia01/os/dinp.pdf>)

U.S. EPA, Draft Frame Work for Cumulative Risk Assessment, peer consultant
(<http://www.epa.gov/ncea/raf/pdfs/CumRisk/CumRiskWR042002.pdf>, US EPA Risk
Assessment Forum, EPA/630/R-01/005, April 2002)

NRC, National Academy of Sciences, National Research Council, Subcommittee on the
Toxicological Risks to Deployed Military Personnel (2002-2004). Issued report: *Review of
the Army's Technical Guides on Assessing and Managing Chemical Hazards to Deployed
Personnel*, 2004.

Scientific Journal Editorial & Review

- *Risk Anal* (Editorial Board member, 2008–present; Peer Reviewer)
- *Toxicol Sci* (Peer Reviewer)
- *J Expos Sci Environ Epi* (Peer Reviewer)
- *Crit Rev Toxicol* (Peer Reviewer)
- *Adv Water Resources* (Peer Reviewer)
- *Water Resources Res* (Peer Reviewer)
- *Dose Response* (Peer Reviewer)

Professional Certification and Affiliations

- Diplomate of the American Board of Toxicology (DABT); 5-year certification awarded October 28, 2008 (2008–2013)
- Society of Toxicology (Full Member, 2008–present)
- Society for Risk Analysis (1984–present)
- Toxicology Forum (2008–present)
- American Association for Advancement in Science (1979–present)